Case Studies of Sediment Removal and Remediation -Data and Lessons

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General

- **All 4 sites impacted by coal tar** *(PAH/MAHs)*
- **Small to medium size sites -- provided opportunities for valuable learning**
- **Work-in-progress**
  - *sites added as data is available*
  - *data synthesis will be presented in multimedia format (text, photos, videos, audio and music)*
  - *CD will be available from EPRI distribution in 2001*

Laconia, NH (1999-2001) -- Mixed Remedy

- **Source control:** *Barrier wall; soil and gas holder removed, 60 K gal GW & 200 gal DNAPL removed*
- **17 K t sediment** *(75% of Contaminants)*
- **215 K gal water removed**
- **6.5 K t capping material**
- **Cost** -- *$4.5MM (Sediments)*
- **Cable-arm, clam-shell, enclosed bucket and conventional equipment used**

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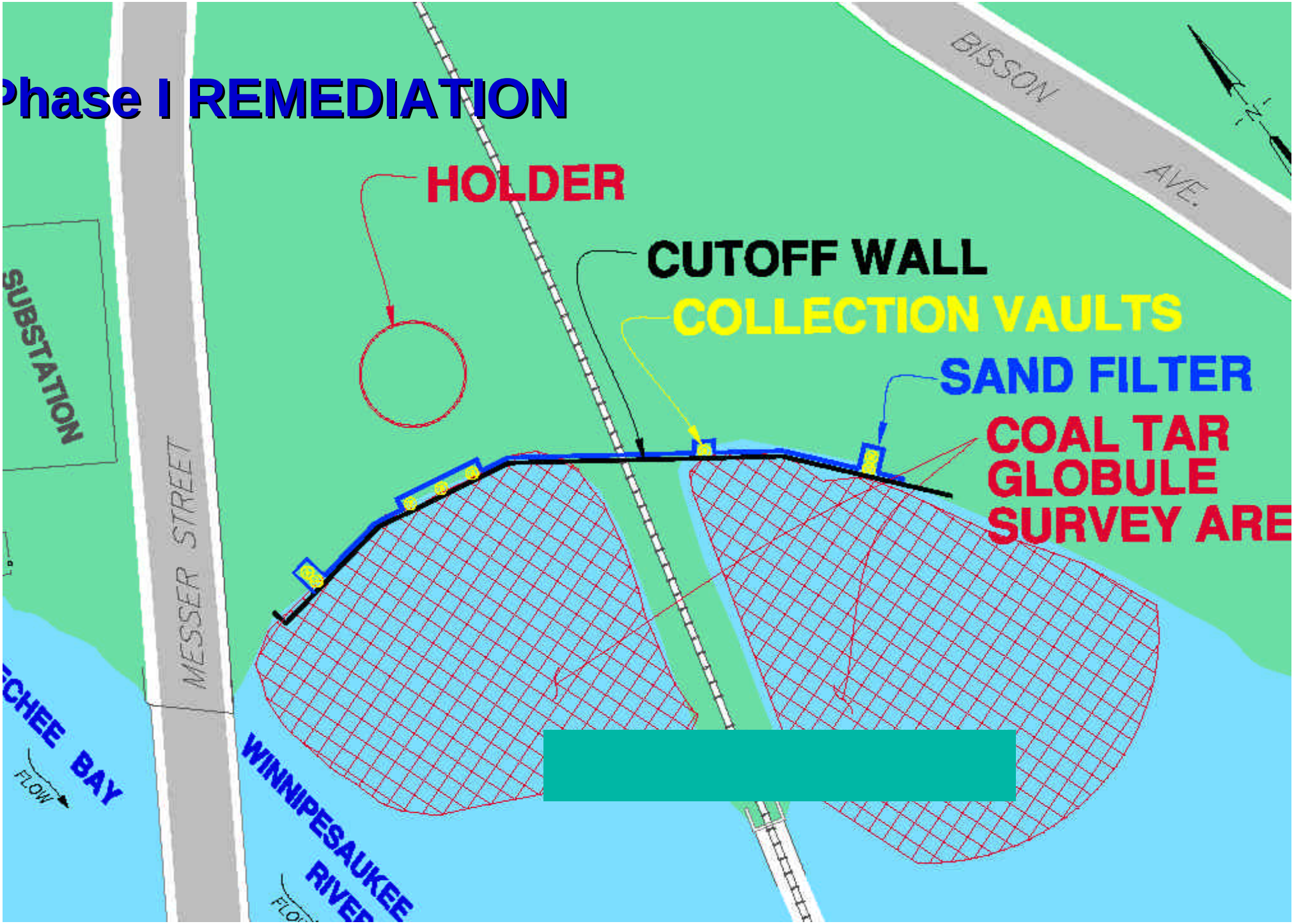
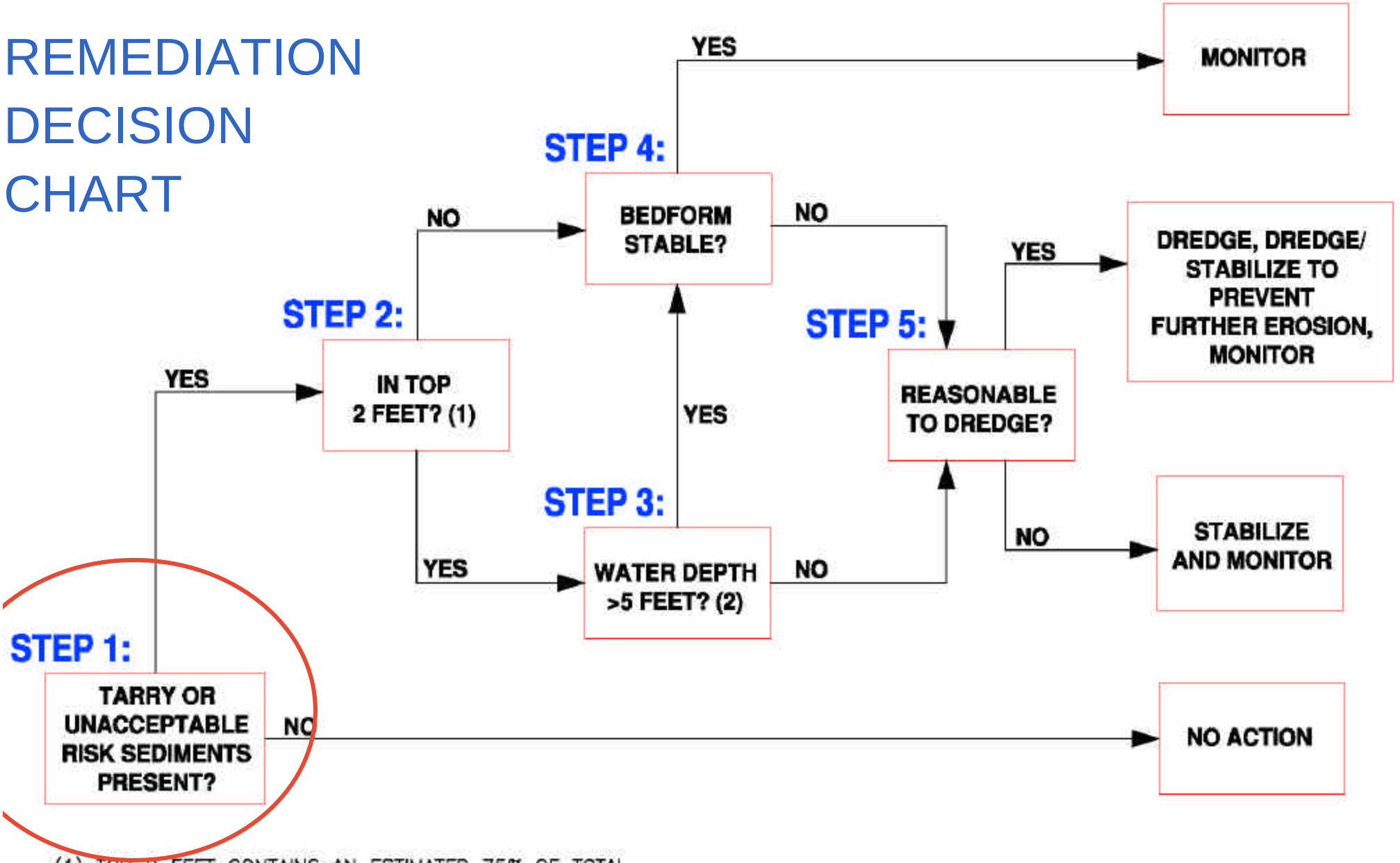

Phase I REMEDIATION
HOLDER
CUTOFF WALL
COLLECTION VAULTS
SAND FILTER
COAL TAR
GLOBULE
SURVEY ARE
BISSON
AVE.
SUBSTATION
MESSER STREET
ECHEE BAY
FLOW
WINNIPESAUKEE
RIVER

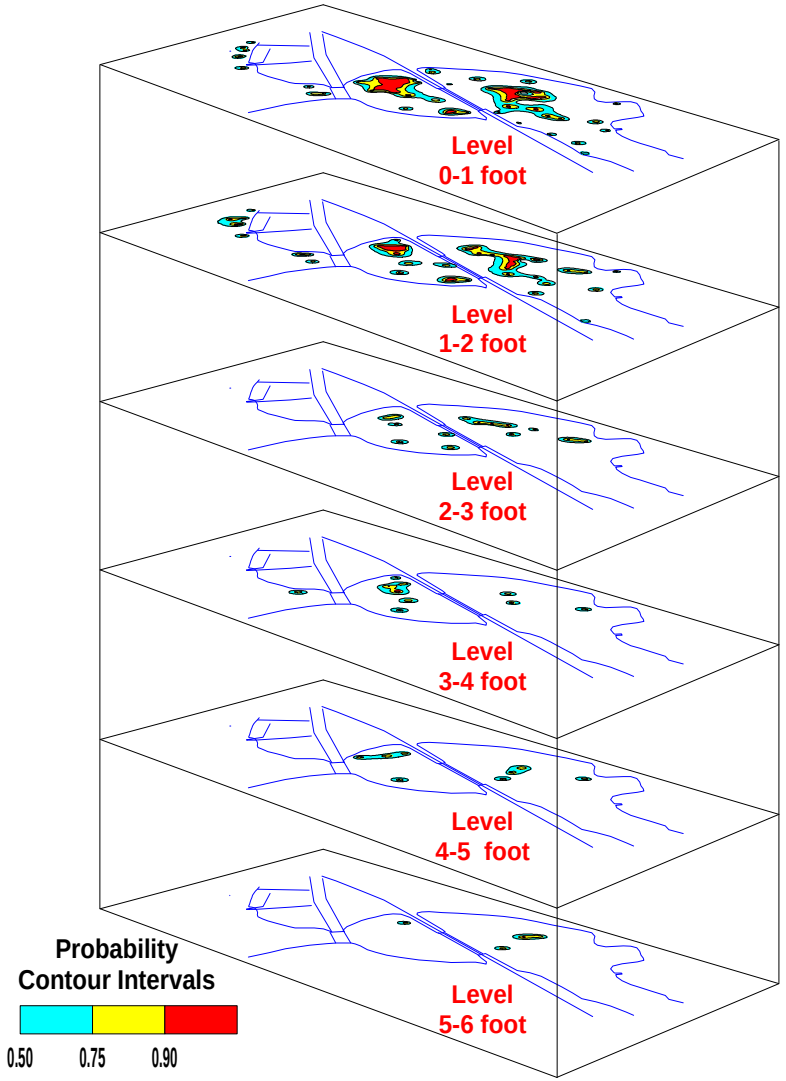
REMEDIATION DECISION CHART



(1) TOP 2 FEET CONTAINS AN ESTIMATED 75% OF TOTAL CONTAMINATED SEDIMENTS IN RIVER.

(2) WATER DEPTHS GREATER THAN 5 FEET CONSIDERED UNLIKELY EXPOSURE PATHWAY FOR HUMAN HEALTH RISK.

PROBABILITY MAPS OF TARRY SEDIMENTS DISTRIBUTION BY 1 FOOT LEVELS MESSER STREET MGP SITE



Messer Street Site
RECOMMENDED REMEDIAT

Stabilize Only

Dredge/Stabilize

Dredge Only

NO SCOUR

Columbia, PA, NPL Site (1998-1999) -- Removal to ERL levels

- **Source Control:** *No active current source*
- **Area Isolated with Porta-dam, 750 T sediments excavated (Conventional), 850 kgal water treated**
- **Cost** *-- $0.5MM (Sediments)*

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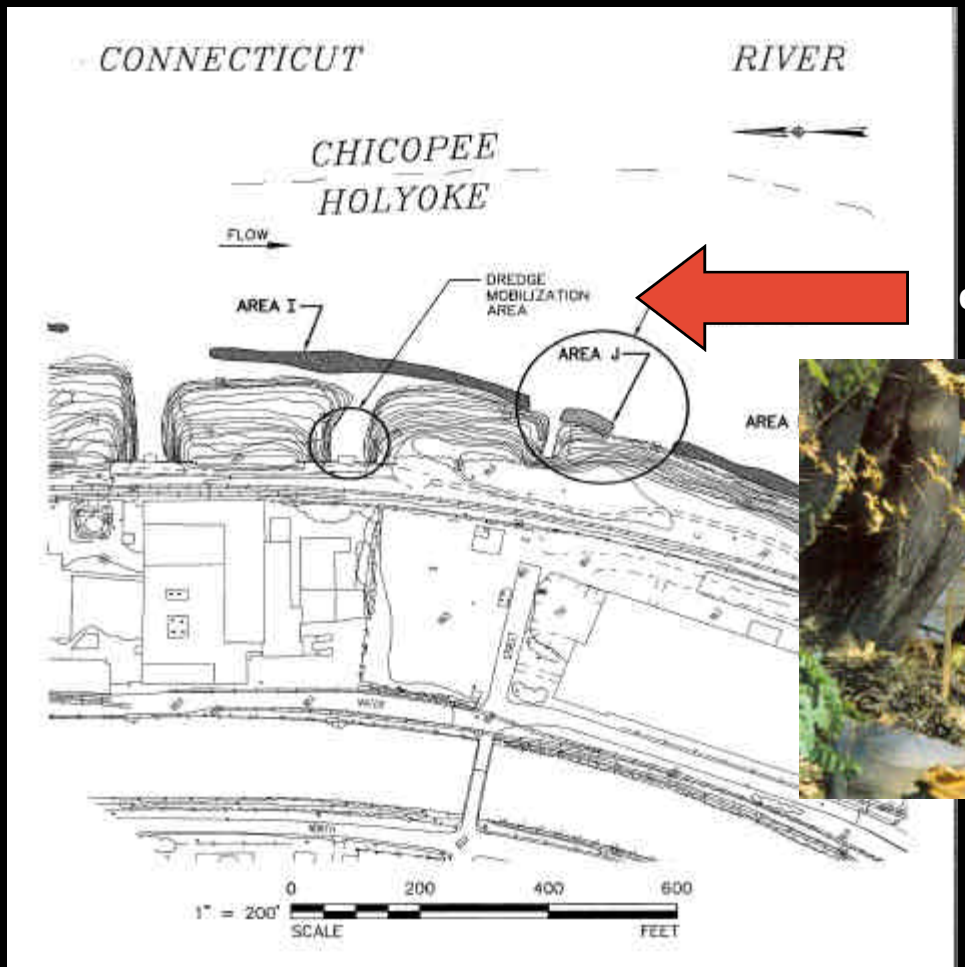
Holyoke, MA (1996) -- Hydraulic Dredging Effectiveness Pilot

- **Removed 12.4 T of sediment / coal tar**
- **Hydraulic dredging ineffective due to:**
  - *presence of cobbles, rocks, debris, swift current*
  - *coal tar/sediments form a hard, asphalt-like conglomerate at bottom*

Site Map and Area of Concern



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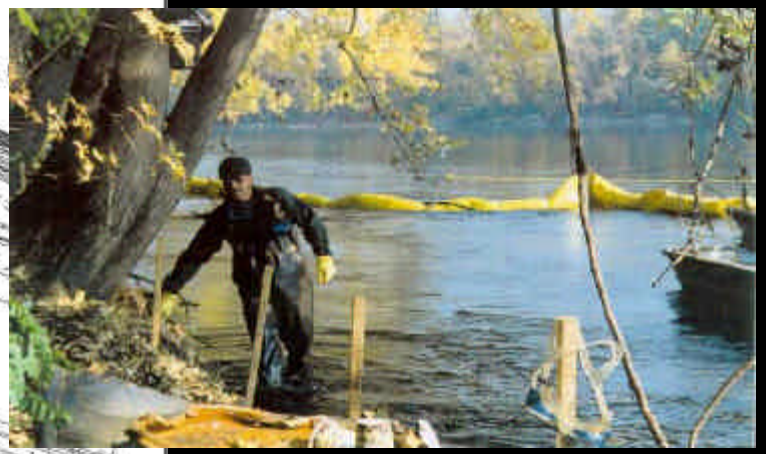

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Salem, MA -- In-Situ bioremediation (1998, 99 -)

- **Source Control:** *Barrier Wall*
- **In-Situ bioremediation of permeable layer**
- **Currently assessing results**
- **Decreased PAH's, No significant washout**

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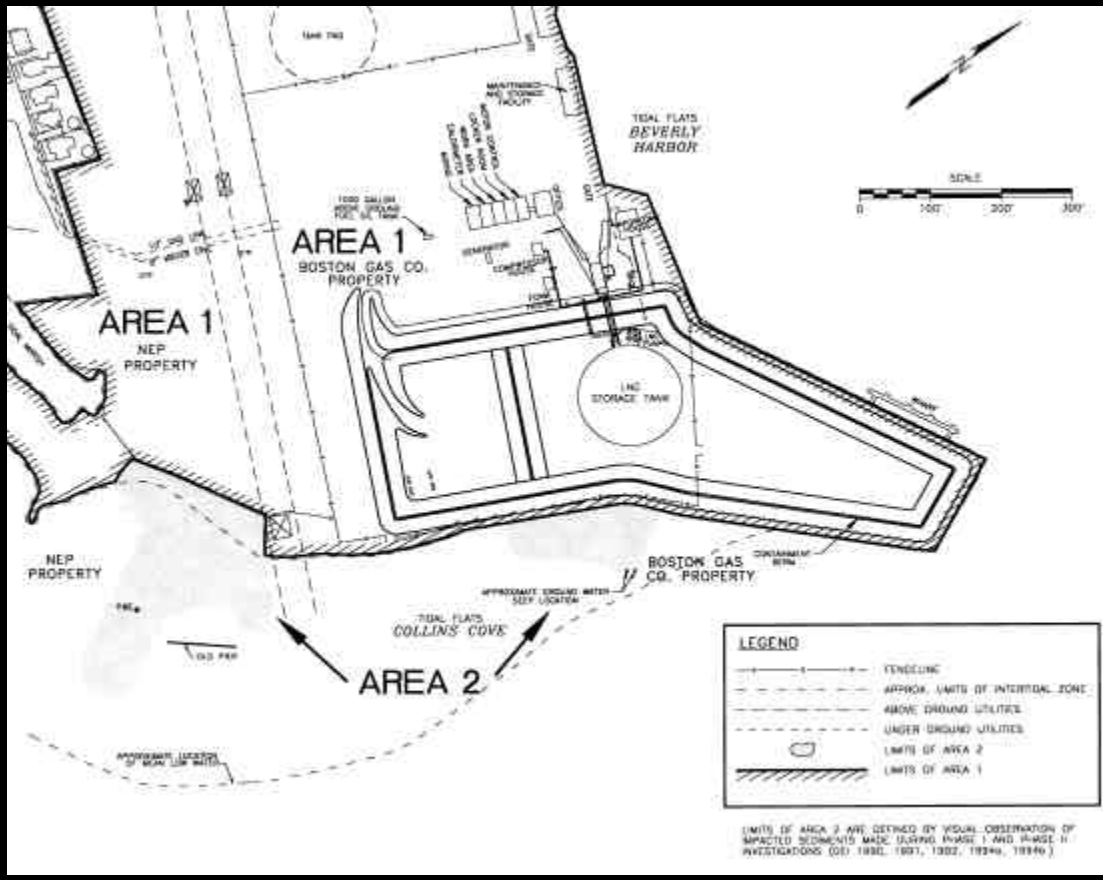
Site Map and Area of Concern

Area of Concern



Overall Lessons - 1

- **Source control necessary**
- **Environmental dredging is more complex, costly and time-consuming than generally anticipated. And it doesn't work everywhere.**
  - *Performance based criteria provides incentives*
  - *Complete removal to Depth? / Level? may not be necessary, if objectives are defined clearly*
  - *Water is not our "friend"*

Overall Lessons - 2

- **Define achievable objectives clearly**
- **Innovate** *(e.g. biotreatment, in-situ residuals management, drawdown extension, mixed remedy)*
- **Positive Community Relations**
  - *Use site as a learning experience*
  - *Odor Control (tent, air monitoring)*

… More Lessons

- **Environmental dredge issues**
  - Productivity, use in hard sediments, debris
- **Turbidity**
  - Differences between Cable-arm, clam-shell, and enclosed bucket for atleast sandy soils may not be as significant considering operational issues?

Results

- **Laconia** - *Fishable-swimmable condition achieved*
- **Columbia** - *Site closure achieved*
- **Holyoke** - *Hydraulic dredging is impractical for coal tar removal (protection of endangered species).*
- **Salem** - *Assessing decrease in contaminants.*

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Future...

- **Long-term assessment**
  - *Maintaining fishable-swimmable / other conditions*
  - *Assessment - chemistry, biology, indicator parameters, presence of* ***signature metabolites?***
- **More turbidity data/operational comparisons between environmental dredges and enclosed buckets needed?**
- **Are we getting better over time!?**
- **Was removal to ERL levels needed?**

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Acknowledgments (alphabetical order)

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- Contractors:
  - *Clean Sites, Golder Associates, Haley & Aldrich, Maxymillian, Menzie-Cura Associates, Metcalf & Eddy, OHM, Parsons, Retec*

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